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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/676,913	10/01/2003	Kaushik Rajashekara	DP-310113	8280

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DELPHI TECHNOLOGIES, INC.  
M/C 480-410-202  
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EXAMINER
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ECHELMEYER, ALIX ELIZABETH

ART UNIT	PAPER NUMBER
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1745

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/25/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/676,913

Applicant(s)

RAJASHEKARA ET AL.

Examiner

Alix Elizabeth Echelmeyer

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 01 November 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 7-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a). Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Amendment***

1. This Office Action is in response to amendments filed November 1, 2006. Claims 1, 9, 10 and 15 have been amended. Claim 6 has been cancelled. Claim 21 has been added. Claims 1-5 and 7-21 are pending and are rejected finally for the reasons given below.

### ***Claim Objections***

2. The objections to the specification and claims 8 and 9 are withdrawn in light of the amendments.
3. The objections to claims 10 and 12 are withdrawn in light of Applicants' explanation.

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 14 and 20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The claims are drawn to a fuel cell system that generates waste heat before,

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during and after generating power; however, the waste heat as claimed in claim 1 is generated by the operation of the fuel cell. It is unclear how the fuel cell can generate heat while it is not in operation. The claim is being interpreted to be drawn to waste heat being generated during the operation of the fuel cell.

6. The rejection of claim 9 is withdrawn in light of the amendments.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1-4, 8, 10, 12-17, 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nomura et al. (US Pre-Grant Publication 2002/0081469) in view of Nakayama et al. (US Pre-Grant Publication 2002/0148498).

Regarding claims 1, 15 and 21, Nomura et al. teach a solid oxide fuel cell system wherein unused fuel and exhaust gases from the fuel cell as well as fuel that has not entered the fuel cell are transferred to a combustor. The combustor and evaporator are in line with one another and are used to heat the reformer and fuel cell system during the start-up phase (Figure 1, [0057]-[0059]). The fuel cell system further comprises a system control unit ([0063]-[0064]).

Regarding claims 2, 3, 4, 16 and 17, Nomura et al. teach the transport of exhaust air from the fuel cell stack, which operates at a high temperature, to the combustor (Figure 1). Further, as seen in Figure 1, all exhaust products, including unused fuel, are provided to the combustor from the fuel cell.

Regarding claim 10, since Nomura teaches a solid oxide fuel cell and solid oxide fuel cells are known to operate at temperatures within the range in claim 10, the fuel cell of Nomura is capable of generating waste heat within that range.

As for claim 12, the combustor of Nomura et al. is used to heat the system during start-up ([0057]-[0059]). Nomura et al. further teach a control system, which would be capable of being programmed to meet the desired limitations of claim 13.

Regarding claims 14 and 20, the fuel cell of Nomura et al. generates heat during operation.

Nomura et al. fail to teach a thermo photovoltaic (TPV) cell that uses heat and other exhaust from the fuel cell stack to provide more power to the load on the system.

Nakayama et al. teach a TPV power generating apparatus that is heated by the combustion gas produced by the reaction of fuel and air (abstract). The heat of the combustion gas is used to heat the emitter, which radiates infrared light that is absorbed by the TPV cells and turned into power ([0024]). Nakayama et al. further teach the use of preheated air in the combustor because it increases the combustion gas temperature, thus increasing the amount of electrical power generated ([0014]).

Nakayama et al. teach that the efficiency of the TPV cells is increased by using the heat of combustion gas as opposed to other sources of heat ([0011]).

It would be advantageous to use the combustor-TPV system of Nakayama et al. in the fuel cell system of Nomura et al. because the fuel cell system already contains a combustor and by substituting the combustor-TPV of Nakayama, the efficiency of the TPV would be increased and the overall system of Nomura et al. would be improved by using the waste heat of the fuel cell to create more power.

As for claim 8, Nomura et al. disclose the claimed invention except for the plurality of fuel cell stacks and plurality of TPV devices. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use more than one of each of these parts, since it has been held that mere duplication of essential working parts of a device involves only routine skill in the art (MPEP 2144.04 (VI)). Further, a plurality of TPV devices would yield a higher power output of the system.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the combustor-TPV of Nakayama et al. with the fuel cell system of Nomura et al. in order to create a system that was more efficient and produced more power than the original fuel cell system alone.

9. Claims 5, 9, 11 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nomura et al. in view of Nakayama et al. as applied to claims 1 and 17 above, and further in view of Iwasaki et al. (US Pre-Grant Publication 2002/0114988).

The teachings of Nomura et al. and Nakayama et al. as discussed above are incorporated herein.

Nomura et al. and Nakayama et al. teach a fuel cell system also containing a TPV for added power generation but fail to teach a heat exchanger to cool the TPV and heat the fuel cell system.

Iwasaki et al. teach a heat exchanger that uses exhaust from a combustor and outside air to provide heat to the fuel cell (abstract, Figure 1). Regarding claim 11, the heat exchanger of Iwasaki et al. uses unheated air ([0024]).

It would be desirable to use the heat exchanger of Iwasaki et al. with the fuel cell system of Nomura et al. and Nakayama et al. because the use of the heat generated by the combustor-TPV combination in the system instead of simply allowing it to exhaust out of the system would increase the efficiency of the overall system.

As for claim 9, the combination of Iwasaki et al. with Nomura et al. and Nakayama et al. discloses the claimed invention except for a heat exchanger connected to a plurality of TPV devices. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide several TPV devices, since it has been held that mere duplication of essential working parts of a device involves only routine skill in the art (MPEP 2144.04 (VI)). Further, a plurality of TPV devices would yield a higher power output of the system.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to combine the heat exchanger of Iwasaki et al. with the system of Nomura et al. in view of Nakayama et al. in order to increase the efficiency of the system.

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10. Claims 7 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nomura et al., Nakayama et al. and Iwasaki et al. as applied to claims 1, 6 and 15 above, and further in view of Sanderson (US Patent Number 6,989,209).

The teachings of Nomura et al., Nakayama et al. and Iwasaki et al. as discussed above are incorporated herein.

Regarding claim 7, Nomura et al., Nakayama et al. and Iwasaki et al. teach the heat exchanger used to cool the TPV cell and the system used power a vehicle but fail to teach a power conditioner for receiving and conditioning the power generated by the system.

Sanderson teaches an energy cycle unit that takes energy from the combustor of the fuel cell system and provides it to a generator (Figure 1, column 4 lines 59-67, column 5 lines 1-14).

It would be desirable to condition the power generated in the system to be used in the intended application because if this step were not taken the system would not serve its intended purpose.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the energy cycle unit of Sanderson with the system of Nomura et al., Nakayama et al. and Iwasaki et al. in order to ensure that the power generated by the system would be used in the intended device.

As for claim 19, Nomura et al. and Nakayama et al. teach the use of exhaust heat from the fuel cell stack in the combustor used to provide heat to the TPV. Nomura



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et al. and Nakayama et al. fail to teach the temperature at which the exhaust products leave the fuel cell.

Sanderson teaches a solid oxide fuel cell such as the one used in Nomura et al. As seen in Figure 3 of Sanderson, the exhaust products leave the solid fuel cell at 849 degrees Celsius.

### ***Response to Arguments***

11. Applicant's arguments filed November 1, 2006 have been fully considered but they are not persuasive.

Regarding the 112 rejection of claims 14 and 20, Applicants argue that the fuel cell may still generate heat while not generating power. The examiner agrees with this statement; however, the fuel cell must be operational to generate heat or power, and can be operating without generating power as Applicants suggest. The fuel cell must be undergoing some sort of operation in the warm-up phase. The examiner interprets the fuel cell to be operating and generating when it is in the warm-up phase, but it is not generating heat before operation.

As for Applicants' argument that Nakayama fails to teach or suggest all of the claim limitations, the examiner agrees. Applicants assert but fail to show that the combination of Nomura et al. and Nakayama et al. teaches the claimed invention; instead, it is only pointed out what Nakayama does not teach of the claimed invention. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413,

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208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In response to Applicants' argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In other words, it is not necessary that the motivation to combine references come from references themselves, but can be from knowledge generally available to one of ordinary skill in the art. In this case, one of ordinary skill in the art would be motivated to use the combustor-TPV of Nakayama et al. in the fuel cell of Nomura et al. as discussed above.

### **Conclusion**

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alix Elizabeth Echelmeyer whose telephone number is 571-272-1101. The examiner can normally be reached on Mon-Fri 7-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's trainer, Susy N. Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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Art Unit 1745

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